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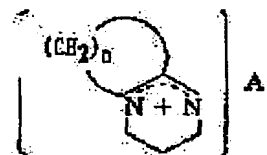
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(54) CONDUCTIVE ROLLER

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a conductive roller using catalysts which do not induce contamination by forming a conductive elastic layer by the polyurethane elastomer obtd. by reactively curing a specific reactive mixture by using the specific catalysts.

SOLUTION: The outer periphery of a revolving shaft is provided with the conductive elastic layer. The conductive elastic layer consists of the polyurethane elastomer obtd. by reactively curing the reactive mixture contg. polyisocyanate, polyol and electrical conductivity imparting agent in the presence of the diazabicycloamine salt catalyst. The diazabicycloamine salt catalyst is the salt of ternary amine, i.e., quaternary ammonium compd. and is expressed by formula. In the formula, (n) is 3, 4, 5 or 6; A is the residue of the acid forming a salt with diazabicycloamine. A is preferably the residue of octyl acid, oleic acid, p-toluene sulfonic acid, formic acid, phenol, orthophthalic acid, acetic acid, maleic acid or boric acid.



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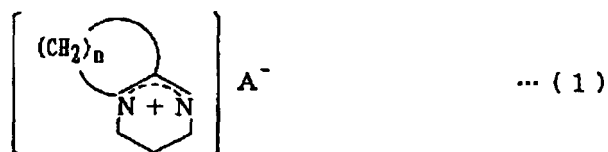
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CLAIMS

[Claim(s)]

[Claim 1] The conductive roller characterized by consisting of the polyurethane elastomer which is made to carry out reaction hardening of the reactant mixture into which an electric conduction elastic layer contains the poly isocyanate, a polyol, and a conductive grant agent in the axis of rotation and the conductive roller which prepared the electric conduction elastic layer in the periphery at this heart under existence of the diazabicyclo amine salt catalyst expressed with a general formula (1), and is obtained.

[Formula 1]



(n is 3, 4, 5, or 6 among a formula, and A is the residue of the acid which forms a diazabicyclo amine and a salt.)

[Claim 2] The diazabicyclo amine of a general formula (1) is 1 and 8-diaza BISHIRO (5, 4, 0)-undecene. - 7 or 1, conductive roller according to claim 1 that is the 5-diazabicyclo (4, 3, 0)-nonene -5.

[Claim 3] The conductive roller according to claim 1 whose A of a general formula (1) is the residue of octylic acid, oleic acid, p-toluenesulfonic acid, a formic acid, a phenol, an orthochromatic phthalic acid, an acetic acid, a maleic acid, or a boric acid.

[Claim 4] The poly isocyanate and a polyol are a liquefied conductive roller according to claim 1 at both ordinary temperature.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the conductive roller which does not pollute the photo conductor (photoconductor drum) which contacts with electrophotography equipment about a conductive roller.

[0002]

[Description of the Prior Art] Generally electrophotography equipments, such as a copying machine, and facsimile, a printer, are equipped with an electrification roller and a conductive roller like a developing roller. For example, with the electrophotography equipment of a 1 component development method, a toner (developer) moves to a photo conductor from the developing roller by which the pressure welding is carried out, an electrostatic latent image is developed, and development accomplishes.

[0003] In order to carry out the pressure welding of such a developing roller to a photo conductor with predetermined contact width of face or for a blade etc. to carry out thin layer support of the toner, it is necessary to have elasticity, and the roller with which the electric conduction elastic layer which consists of the elastomer (elastic body) which contains a conductive grant agent by the low degree of hardness on the periphery of the axis of rotation typically was formed is used.

[0004] It deforms easily, and excels in stability, and the polyurethane elastomer which moreover does not pollute a photo conductor is preferably used for the electric conduction elastic layer of these rollers.

[0005] The poly isocyanate and a polyol are made to react, and when forming the electric conduction elastic layer which consists of a polyurethane elastomer, in order to adjust a reaction rate and to improve workability, a catalyst is usually used.

[0006] The catalyst used most widely is a tertiary amine catalyst. A tertiary amine catalyst is a triethylenediamine, N-methyl morpholine, N-ethyl morpholine, a dimethylethanolamine, a 1-methyl-4-dimethylaminoethyl piperazine, and 3-methoxy. - They are N and N-dimethyl propylamine, N, and N-diethyl-3-diethylamino propylamine, 1, 2-dimethyl imidazole, a dimethyl benzylamine, and the screw (2-dimethylaminoethyl) ether.

[0007] If the conductive roller which has the electric conduction elastic layer which consists of the polyurethane elastomer using the aforementioned catalyst is used for

electrophotography equipment, it will often happen that a catalyst oozes from an electric conduction elastic layer while in use.

[0008] Especially this phenomenon is remarkable under high temperature and high humidity. If a catalyst oozes out, the photosensitive layer on the front face of a photo conductor which contacts will be attacked, and it will pollute. As a result, the dissolution (a photo conductor base is exposed) advances to discoloration of a photo conductor, cloudiness, and a pan.

[0009] Since degradation of such a photo conductor produces poor electrification of a photo conductor, when it copied or prints, finally it will give a picture defect (a picture is disturbed).

[0010]

[Problem(s) to be Solved by the Invention] Thus, when the conductive roller was manufactured by the polyurethane elastomer using the catalyst currently used conventionally, there was a problem of the contact contamination by the photo conductor or the catalyst contained in an electric conduction elastic layer to a member in addition to this.

[0011] this invention was not accomplished in view of this problem, and aims at offering the conductive roller using the catalyst which does not cause contamination.

[0012]

[Means for Solving the Problem] this invention relates to the conductive roller which uses as an electric conduction elastic layer the polyurethane elastomer which carried out reaction hardening with the catalyst with a temperature sensitivity. According to this invention, in the conductive roller which prepared the axis of rotation and the electric conduction elastic layer formed in the periphery, the conductive roller which consists of the polyurethane elastomer which is made to carry out reaction hardening of the reactant mixture of which an electric conduction elastic layer contains the poly isocyanate, a polyol, and a conductive grant agent, and consists under existence of a diazabicyclo amine salt catalyst, and is obtained is offered.

[0013] In order to protect not only the electric conduction elastic layer that consists of a monolayer but an electric conduction elastic layer and to give environmental stability to this layer, the electric conduction elastic layer which prepared the surface coating layer in the periphery further is sufficient as an electric conduction elastic layer.

[0014] The polyurethane elastomer which can be used by this invention makes a chain extension agent, a cross linking agent, etc. react the poly isocyanate, a polyol, and if needed, and is obtained. Aliphatic series, an alicycle group, or which an aromatic thing

may be used for the poly isocyanate. As a desirable poly isocyanate, 4 and 4'-diphenylmethane diisocyanate (MDI), a polymethylene polyphenyl isocyanate (polymeric MDI), dicyclohexylmethane diisocyanate (hydrogenation MDI), hexamethylene di-isocyanate (HDI), isophorone diisocyanate (IPDI), xylylene diisocyanate, tolylene diisocyanate, naphthalene diisocyanate, phenylene diisocyanate, and these denaturation objects are mentioned. A denaturation object means the dimer from which the poly isocyanate is obtained in response to mutual, a trimer or an urethane denaturation object, a urea denaturation object, etc. These poly isocyanates can be used as independent or two or more sorts of mixture. In this invention, the poly isocyanate used has a liquefied desirable thing in ordinary temperature (10-40 degrees C). Especially desirable things are Denaturation MDI, a polymeric MDI, Hydrogenation MDI, TDI, and HDI, and IPDI.

[0015] The polyols which can be used by this invention are a polyether polyol, a polyester polyol, etc. As a polyether polyol, a polyethylene polyether glycol, a polypropylene ether glycol, a polytetramethylene ether glycol, polyhexamethylene ether glycol, the poly octamethylene ether glycol, PORIDEKA methylene ether glycols, and such mixture can be mentioned. It is also possible to use as a polyol what has three or more hydroxyl groups, for example, a polypropylene ether polyol, into 1 molecule. What is obtained by making a dibasicity acid react with a glycol as a polyester glycol is mentioned. As a dibasicity acid, there are an alkyl derivative, a halogen derivative, etc. of an adipic acid, a succinic acid, a sebacic acid, terephthalic acids, and these acids, and there are ethylene glycol, a diethylene glycol, a propylene glycol, etc. as a glycol. Furthermore, the poly caprolactone polyol by the ring opening polymerization of lactone etc. can be used. These polyols can be used as independent or two or more sorts of mixture. Although choosing and using together the amount polyol of macromolecules and a low-molecular-weight polyol from among the aforementioned things as a polyol is generally performed, it is desirable that the ratio of each polyol is usually within the limits of 100 / 0 - 95/5 (former/latter) in a weight ratio in that case. In this invention, especially the thing for which a macromolecule polypropylene ether glycol and the mixture of a low-molecular-weight polyol are used is desirable.

[0016] It is desirable like the poly isocyanate to use a liquefied polyol in ordinary temperature. Especially desirable things are a polypropylene ether glycol, a polypropylene ether polyol, a beta-methyl-delta-valerolactone polyol, and 3-methyl pentylene horse mackerel peat. The reason the liquefied poly isocyanate and a polyol are suitably used in ordinary temperature by this invention is it is not only safe, but

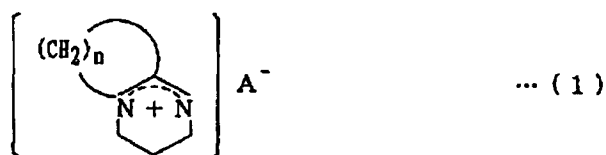
that it is easy to do operation of measurement, mixture, casting, etc. in ordinary temperature as liquefied, and becomes saving of fuel and light prices.

[0017] The chain extension agent other than the poly isocyanate and a polyol can also be used. As a chain extension agent, there are a hydroxy chain extension agent and an amine chain extension agent. As a hydroxy chain extension agent, ethylene glycol, propylene-glycol, diethylene-glycol, 1, 4-butanediol, 1, and 6-hexandiol etc. is mentioned. As an amine chain extension agent, ethylenediamine, 1, 2-propylenediamine, a tetramethylenediamine, a hexamethylenediamine, a deca methylene diamine, an isophorone diamine, m-xylylene diamine, a hydrazine, etc. are mentioned. In a polyurethane-ized reaction, you may use a cross linking agent. A BIDOROKISHI cross linking agent and an amine cross linking agent are in a cross linking agent as well as a chain extension agent. Hydroxy cross linking agents are a glycerol, a trimethylol propane, and other alkylene triol. Amine cross linking agents are an alkanolamine, for example, a diethanolamine, tri-isopropanolamine, etc.

[0018] The diazabicyclo amine salt catalyst which can be used by this invention is, the salt, i.e., the 4th class ammonium compound, of tertiary amine, and is a general formula (1).

[0019]

[Formula 1]



[0020] (— n is 3, 4, 5, or 6 among a formula, and A is the residue of the acid which forms a diazabicyclo amine and a salt Although it is the diazabicyclo amine salt expressed with), the desirable example of the acid which forms a salt is octylic acid, oleic acid, p-toluenesulfonic acid, a formic acid, a phenol, an orthochromatic phthalic acid, an acetic acid, a maleic acid, or a boric acid. The desirable example of a diazabicyclo amine is 1 and 8-diazabicyclo. -(5, 4, 0)- It is undecene. - It is the 7 (DBU) and 1, and 5-diazabicyclo (4, 3, 0)-nonene -5 (DBN). Especially desirable catalysts are a DBU-phenol salt, DBU-formate, and a DBU-octylic acid salt. The amount of such catalyst used has per [0.2] polyol 100 weight section - the 1.0 desirable weight sections, and it is the 0.3 - 0.5 weight section more preferably.

[0021] The important unilateral side of this invention is performing a hardening reaction by making the aforementioned diazabicyclo amine salt into a catalyst, and

forming an electric conduction elastic layer. Generally catalytic activity is so high that basicity is high among tertiary amine, and the diazabicyclo amine contained in general formulas (1), such as DBU, DBN, etc. which do not have steric hindrance to the lone-pair electrons of this point amine nitrogen, is desirable as a polyurethane-ized catalyst. However, since basicity is high, if a diazabicyclo amine is used independently, the catalyst which remains in the fabricated electric conduction elastic layer will ooze out from a roller. When this roller contacts a photo conductor, it is as above-mentioned that a catalyst pollutes a photo conductor front face. The feature is in this invention to use this amine with the gestalt of a salt with the acid which has a temperature sensitivity instead of such a diazabicyclo amine. That is, although the diazabicyclo amine salt used by this invention hardly shows catalytic activity with ordinary temperature, for example, 10 degrees C - 40 degrees C, since it is the gestalt of a salt, if it becomes constant temperature, for example, 70 degrees C - 150 degrees C, a diazabicyclo amine will separate and catalytic activity will discover it. Thus, the diazabicyclo amine salt used by this invention is a temperature sensitivity, and if cooled to per after [a polyurethane-ized reaction] ordinary temperature, it will return to the gestalt of the original salt again. Although basicity falls that it is the gestalt of a salt and catalytic activity is also lost, it becomes that there is also no contamination to a photo conductor. The reason the amount of the catalyst used is the aforementioned range is that there is possibility of photo conductor contamination when sufficient catalytic activity is not obtained with their being under the 0.2 weight sections and the 1.0 weight section is exceeded.

[0022] It is usually beforehand used for it, adding a conductive grant agent to a polyol and distributing it uniformly, although conductivity is given to a polyurethane elastomer. As this conductive grant agent, a tin-oxide particle besides carbon black etc. is mentioned. A desirable conductive grant agent is carbon black. the amount used -- the polyol 100 section -- receiving -- the 0.2 - 1.0 weight section -- it is the 0.5 weight section preferably [0023] The polyurethane elastomer used for the conductive roller of this invention can be manufactured by the well-known method. For example, if it is the poly isocyanate, a polyol, a catalyst, and a request, other assistants will be mixed and a polyurethane elastomer will be obtained by carrying out reaction hardening. NCO/OH which is the ratio of the NCO basis and OH basis by which the compounding ratio of the poly isocyanate component and a polyol component is contained in each -- 0.95-1.20 -- it is made to adjust and react to 1.00-1.10 preferably As for a reaction, it is desirable to use the liquefied poly isocyanate and a polyol in ordinary temperature as mentioned above, and to carry out

reaction hardening with a non-solvent. The assistants which can be used for this invention are a coloring agent, a flame retarder, an anti-oxidant, a release agent, etc.

[0024] In order to put reactant mixture (a catalyst is included) into the metal mold of environmental temperature and to really which is the method of operation of this invention perform hardening after restoration in the fabricating method, metal mold is heated in temperature of 70–150 degrees C. According to the method of another operation, after filling up the metal mold which carried out preheating of the reactant mixture to 80 degrees C, in order to perform hardening, metal mold is similarly heated to 150 degrees C. It is attained when putting metal mold on the oven set as temperature with heating of metal mold a little higher than a desired die temperature in any case. As for a die temperature, in 70 degrees C – 150 degrees C of any cases, it is preferably maintained by 80 degrees C – 110 degrees C for a hardening reaction.

[0025]

[Function] since a temperature sensitivity catalyst is used in this invention — metal mold — if the temperature of inner reactant mixture rises, a diazabicyclo amine salt catalyst will separate a diazabicyclo amine, and a hardening reaction will be promoted by this catalysis Typically, although the setting time for 20 – 30 minutes is required, according to the method of this invention, the setting time is shortened in about 10 minutes. It unmolds by the conventional method after hardening, and the fabricated conductive roller is obtained. Although the conductive roller of this invention is useful as a conductive roller of electrophotography equipment, it is applicable also to the conductive roller covering other many uses. If the aforementioned amine salt will separate a diazabicyclo amine, and will show strong catalytic activity in the temperature of 70–150 degrees C, hardening will be completed, and a polyurethane elastomer will be formed, if a temperature sensitivity amine catalyst, especially a diazabicyclo amine salt catalyst are used for an urethane generation reaction, and it returns to ordinary temperature further, although it will become an amine salt again and will remain into a generation polyurethane matrix, it does not ooze out from a polyurethane elastomer.

[0026]

[Example] Although an example and the example of comparison explain this invention, these do not limit the range of this invention. Especially the section is the weight section except being shown. Moreover, MW expresses molecular weight and f expresses the number of functional groups.

[0027] After improving the example 1 polypropylene ether glycol (MW=3000, f= 2, Sumitomo Beyer urethane incorporated company make) 98 section, the polypropylene

ether polyol (MW=400, f= 4, Sumitomo Beyer urethane incorporated company make) 2 section, and the carbon black 0.5 section mixed churning, it scoured with a roll and the polyol component was made to distribute carbon black uniformly.

[0028] Subsequently, the DBU-phenol salt (San Apro, Inc. make) 0.3 section was added and agitated as a catalyst to this mixture, and the catalyst was distributed. After mixture became uniform, reduced pressure dehydration was carried out by 40 degrees C and the pressure of 3 or less Torrs for 5 hours.

[0029] the roller which heated metal rodding (axis of rotation) which applied adhesives to the periphery at 80 degrees C -- public funds -- it set to type Subsequently, Denaturation MDI (SI-0389, the Sumitomo Beyer urethane incorporated company make) was agitated by the agitator after addition mixture into the polyol mixture which is the above, and was made and prepared. The solution temperature at the time of churning was set as 40 degrees C. Reactant mixture is poured into the metal mold which preheated at 80 degrees C after a churning end, reaction hardening was carried out for 10 minutes, and the roll-forming object which formed the polyurethane elastomer in the periphery of the axis of rotation was acquired. After unrolling this and carrying out neglect dryness at a room temperature on the 1st, surface polish was carried out with the grinder and the conductive roller was obtained.

[0030] The conductive roller was manufactured like the example 1 except having made the addition of the DBU-phenol salt in example 2 example 1 into the 0.5 sections.

[0031] It replaced with the DBU-phenol salt in example 3 example 1, and the conductive roller was manufactured like the example 1 except having used the DBU-formate 0.3 section (San Apro, Inc. make).

[0032] It replaced with the DBU-phenol salt in example 4 example 1, and the conductive roller was manufactured like the example 1 except having used the DBU-octylic acid salt 0.3 section (San Apro, Inc. make).

[0033] It replaced with the DBU-phenol salt in example of comparison 1 example 1, and the conductive roller was manufactured like the example 1 except having used the triethylenediamine (Mitsui Toatsu Chemicals, Inc. make) 0.5 section.

[0034] It replaced with the DBU-phenol salt in example of comparison 2 example 1, and the conductive roller was manufactured like the example 1 except having used the 2-methyl imidazole (San Apro, Inc. make) 0.3 section.

[0035] It replaced with the DBU-phenol salt in example of comparison 3 example 1, and the conductive roller was manufactured like the example 1 except having used the DBU(San Apro, Inc. make)0.3 section independently.

[0036] It replaced with the DBU-phenol salt in example of comparison 4 example 1, and the conductive roller was manufactured like the example 1 except having used the DBN(San Apro, Inc. make)0.3 section independently.

[0037] It was left for one week under the atmosphere of the temperature of 35 degrees C, and 85% of humidity, pressing each roller of the photo conductor stain resistance test aforementioned example and the example of comparison against the photo conductor for copying machines. Contamination of a photo conductor was observed about each case with the naked eye. These results are shown in Table 1.

[0038]

[Table 1]

ローラ	感光体汚染
実施例 1	○
実施例 2	○
実施例 3	○
実施例 4	○
比較例 1	×
比較例 2	×
比較例 3	×
比較例 4	×

○：感光体汚染なし

×：感光体汚染あり（感光体が曇る）

[0039] In addition, in the example of the example 4 of comparison, a part of dissolution of a photo conductor front face was obtained.

[0040]

[Effect of the Invention] By having used the catalyst which has a temperature sensitivity in the case of a polyurethane-ized reaction, the conductive roller of this invention oozes from the roller of the catalyst in the operating-environment temperature of a roller, ** is not only suppressed completely substantially, but in a hardening reaction, remarkable catalytic activity is discovered by the temperature up and a hardening reaction completes it promptly by it.

[0041] In this way, since the setting time is shortened, the cycle time of a reaction, hardening, and unmolding becomes short, rotation of metal mold becomes early, and productivity improves.

[0042] And even if the conductive roller of this invention is built into electrophotography equipment and it uses it for a long period of time, it does not pollute a photo conductor.